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NCBC DAVISVILLE  
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LETTER REGARDING THE TRANSMITTAL OF EXECUTIVE SUMMARY AND SUPPORTING  
TABLES AND FIGURES FOR HUMAN HEALTH RISK EVALUATION FOR SOILS AT  
CONSTRUCTION EQUIPMENT DEPARTMENT SITES 2 AND 3, STUDY AREAS 1 AND 4  
NCBC DAVISVILLE RI  
12/06/2010  
BASE REALIGNMENT AND CLOSURE PROGRAM MANAGEMENT OFFICE NORTHEAST



**DEPARTMENT OF THE NAVY**  
BASE REALIGNMENT AND CLOSURE  
PROGRAM MANAGEMENT OFFICE, NORTHEAST  
4911 SOUTH BROAD STREET  
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BPMO NE/DB  
Ser 11-029  
December 6, 2010

Ms. Christine Williams  
Remedial Project Manager  
U.S. Environmental Protection Agency, Region I  
5 Post Office Square, Suite 100  
Mail Code OSRR07-03  
Boston, MA 02109-3912

Mr. Richard Gottlieb  
Office of Waste Management  
Rhode Island Department of Environmental Management  
235 Promenade Street  
Providence, RI 02908-5767

Dear Ms. Williams and Mr. Gottlieb:

Enclosed please find the executive summary and supporting tables and figures for a human health risk evaluation for soils at the former Construction Equipment Department (CED) at the former Naval Construction Battalion Center (NCBC) Davisville in North Kingstown, Rhode Island. The former CED Area is comprised of Navy Installation Restoration Sites 02 and 03 and Study Areas 01 and 04, corresponding to EPA Operable Unit 07.

The human health risk evaluation utilizes historical soil sampling data collected during Study Area Screening Evaluations, Removal Actions, and Remedial Investigation activities conducted at the CED Area between 1986 and 2007. Historical data are compared to present day human health risk-based screening values to complete a risk ratio analysis. Based on the evaluation of historical soil sampling data, the Navy believes there is sufficient information to support a limited action soils remedy for the CED Area consisting of land-use controls and five-year reviews.

The Navy is not soliciting written comments on the attached material at this time. Instead, we would like to request a meeting at which we will present a more complete discussion of the risk evaluation so that EPA and RIDEM will have the opportunity to provide input that will be used to complete the draft risk evaluation. Our planned January 11, 2011 meeting in Rhode Island would be an appropriate time for this presentation and discussion. Please advise whether your technical experts will be available to participate on this date.

If you have any questions, please do not hesitate to contact the Remedial Project Manager, Mr. Jeff Dale, at 215-897-4914.

Sincerely,

A handwritten signature in black ink, appearing to read "David Barney", written over a horizontal line.

David Barney  
BRAC Environmental Coordinator  
By direction of BRAC PMO

Enclosure:

Summary Information for Human Health Risk Evaluation for Soils, Construction  
Equipment Department, Former NCBC Davisville, North Kingstown, Rhode Island.

Copy to:

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**ENCLOSURE (1)**

**SUMMARY INFORMATION FOR HUMAN HEALTH RISK EVALUATION FOR SOILS  
CONSTRUCTION EQUIPMENT DEPARTMENT, FORMER NCBC DAVISVILLE**

**EXECUTIVE SUMMARY  
HUMAN HEALTH RISK EVALUTION FOR SOILS  
CONSTRUCTION EQUIPMENT DEPARTMENT  
NCBC DAVISVILLE**

A human health risk ratio evaluation (HHRRE) of chemical concentrations detected in soil was conducted for the Construction Equipment Department (CED) within the Former Naval Construction Battallion Center (NCBC) Davisville located in Kingstown, Rhode Island. The following Sites and Study Areas comprise the CED Area:

- Study Area 01, Drum Storage Area
- Site 02, Battery Acid Disposal Area
- Site 03, Solvent Disposal Area
- Study Area 04, Asphalt Disposal Area

For the purposes of this evaluation, each study area/site was evaluated individually even though it is anticipated that remedial measures will be taken to address the entire CED Area as one operable unit.

The risk evaluation was based on soil analytical data collected during various investigations completed over the course of several years. The HHRRE evaluated potential risks to a range of potential receptors in order to evaluate risks for current and hypothetical future land use scenarios. The following receptors were evaluated: 1) lifelong resident, adult and child; 2) lifelong recreational users, adult and child; 3) construction workers; and 4) industrial workers.

Chemicals of potential concern (COPCs) were selected based on a toxicity screen of maximum site concentrations to USEPA Regional Screening Levels (RSLs) for residential soil (May 2010) and RIDEM screening levels (February 2004) for residential soil. Estimates of cancer risk and hazard indices for the study areas/sites for which COPCs were selected were developed using a risk-ratio technique using 95% Upper Confidence Limits (UCLs) or maximum concentrations, where applicable, to represent site concentrations and USEPA screening levels for residential and industrial receptors or calculated screening criteria (based on USEPA methodology) for recreational and construction worker receptors. Estimated cancer risks and hazard indices for each study area/site and each receptor are presented in Summary Table 1.

The following is a summary of the key results of the HHRRE and the uncertainties potentially impacting the interpretation of these results:

- All estimated incremental lifetime cancer risks (ILCRs) were less than or within the USEPA target range of 1E-04 to 1E-06.
- Estimated cancer risks for residents potentially exposed to COPCs in the Study Area 01 and Study Area 04 surface soil exceeded the State of Rhode Island cancer risk limit of 1E-05. The cPAHs were the primary risk drivers for Study Area 01, and Total Aroclor was the primary risk driver for Study Area 04. It should be noted that arsenic would also be considered a risk driver if evaluated as a COPC; however, arsenic concentrations in Study Area 01 surface soils are within literature background concentrations and within NCBC Davisville background values. Consequently, arsenic is not selected as a COPC or chemical of concern (COC) for Study Area 1. It should also be noted that no site-specific PAH background values were available for comparison to site soil concentrations;
- The HI estimated for surface soil in Study Area 04 exceeded the HI threshold of 1.0 for the residential scenario. Total Aroclor was the primary risk driver. However, the historical data comprising the Study Area 04 surface soil data set did not specify concentrations for the individual Aroclor mixtures (i.e., total Aroclor data only is available). Risk-based criteria for Aroclor-1254 were conservatively used to evaluate the Total Aroclor concentrations in the absence of compound/mixture-specific data. If criteria for another Aroclor mixture (e.g., Aroclor-1260) were used, the HI for Study Area 04 surface soil would not exceed 1.0.
- The HI estimated for subsurface soil of Site 02 exceeded the HI threshold of 1.0 for the construction worker scenario. Manganese was the primary risk driver. No site-specific background data were available for manganese. However, a comparison of site data to literature background values indicated that all detected manganese concentrations were within range of naturally occurring background levels. (see Summary Table 1).
- Risks to human receptors were not evaluated for deep subsurface soil (i.e., soil greater than 10 feet bgs) because human contact with deep subsurface soil is unlikely. However, elevated concentrations (i.e., concentrations exceeding criteria by more than an order of magnitude) of 1,1,2,2-tetrachloroethane and trichloroethene were noted in Site 03 deep subsurface soil. No other chemicals had significantly higher concentrations in deep subsurface soil than in the shallower soil data sets.
- No toxicity criteria are available for total petroleum hydrocarbons (TPH) in the USEPA RSL table. TPH concentrations reported for the Site 03 surface soil exceeded the RIDEM residential and industrial soil screening criteria.

The results of this risk evaluation are not directly comparable to risk estimates that were developed previously during the Remedial Investigation (RI) for the CDA Area, however the conclusions of the evaluation are similar. The *Revised Draft Final Phase III Remedial Investigation* (EA, December 1998) incorporated data from only Sites 02 and 03. The data for Sites 02 and 03 were combined into one data set and evaluated because anticipated future development was similar at each of the sites. The Phase III RI evaluated residential exposure to groundwater ingestion only, and recreational users were not evaluated. However, construction workers and industrial workers were evaluated for exposures to chemicals in soil. Construction workers were evaluated for exposure to surface and subsurface soil, but industrial workers were evaluated for exposures to surface soil only.

The Phase III RI cancer risk estimates for construction worker and industrial worker exposures to soil are similar to the estimates presented in this HHRRE. The construction worker cancer risk for Sites 02/03 soil was 3E-07 in the Phase III RI, and the industrial worker cancer risk was 1E-06 for Sites 02/03 soil in the Phase III RI. Noncancer estimates for these receptors were slightly greater in the current HHRRE for Sites 02 and 03 than in the Phase III RI but similarly did not exceed 1.0 except in Site 02 subsurface soil due to manganese. As noted in Summary Table 1, manganese concentrations in Site 02 subsurface soil likely reflect background concentrations.

Chemicals of concern (COCs) retained for each of the study areas are presented in Summary Table 2. COCs for groundwater protection, selected by a qualitative analysis using USEPA soil screening levels (SSLs), are presented in Summary Table 3.

Based on the results of the HHRRE, these data could support a limited action remedial response (residential land-use restriction) for soils in the CED Area.

## TABLES

## SUMMARY TABLE 1

**SUMMARY OF CANCER AND NON-CANCER RISK ESTIMATES AND RISK DRIVERS<sup>(1)</sup> FOR  
RECEPTOR EXPOSURE TO SURFACE AND SUBSURFACE SOIL  
HUMAN HEALTH RISK RATIO EVALUATION  
CED AREA, FORMER NCBC DAVISVILLE  
NORTH KINGSTOWN, RHODE ISLAND  
PAGE 1 OF 2**

Receptor	Site/Study Area	Surface Soil		Subsurface soil	
		Hazard Index	Cancer Risk Estimate	Hazard Index	Cancer Risk Estimate
Construction Worker	01	0.7	3E-07	1	1E-07
	02	0.5	7E-08	<b>3</b> <b>(Manganese)<sup>(2)(5)(7)</sup></b>	1E-07
	03	0.5	1E-07	1	9E-08
	04	1	3E-07	NA	NA
Industrial Worker	01	0.08	4E-06	0.1	2E-06
	02	0.06	9E-07	0.3	2E-06
	03	0.07	2E-06	0.07	1E-06
	04	0.4	5E-06	NA	NA
Recreational User	01	0.1	7E-06	0.2	1E-06
	02	0.1	6E-07	0.4	1E-06
	03	0.1	1E-06	0.1	8E-07
	04	0.7	3E-06	NA	NA
Resident	01	1	<b>3E-05</b> <b>(cPAHs<sup>(4)</sup>)</b> <b>4E-05</b> <b>(cPAHs<sup>(4)</sup> and Arsenic<sup>(5)</sup>)</b>	1	7E-06
	02	0.7	4E-06	3 (target organ HIs < 1) <sup>(3)</sup>	6E-06
	03	0.9	7E-06	1	5E-06
	04	<b>4</b> <b>(Total Aroclor<sup>(6)(8)</sup>)</b>	<b>2E-05</b> <b>(Total Aroclor<sup>(8)</sup>)</b>	NA	NA

1 - A noncarcinogenic risk driver is a chemical that contributes substantially to a target organ specific HI that exceeds 1. A carcinogenic risk driver is a chemical with a calculated cancer risk estimate exceeding 1E-06 when the total cancer risk for the receptor exceeds 1E-05.

2 - Bolded non-carcinogenic risk estimates exceed an HI of 1. Bolded carcinogenic risk estimates exceed the State of Rhode Island cancer risk limit of 1E-05. A chemical name presented in parentheses indicates the primary chemical driving risk.

3 - Although the HI exceeds 1, adverse noncancer effects are not anticipated because individual target-organ HIs are less than 1.

## SUMMARY TABLE 1

**SUMMARY OF CANCER AND NON-CANCER RISK ESTIMATES AND RISK DRIVERS<sup>(1)</sup> FOR  
RECEPTOR EXPOSURE TO SURFACE AND SUBSURFACE SOIL  
HUMAN HEALTH RISK RATIO EVALUATION  
CED AREA, FORMER NCBC DAVISVILLE  
NORTH KINGSTOWN, RHODE ISLAND  
PAGE 2 OF 2**

- 4 – The cancer risk was estimated for benzo(a)pyrene equivalents calculated using ½ the non-detected result. If calculating benzo(a)pyrene equivalents using 0 for non-detected values, the total cancer risk estimate for residents exposed to Study Area 01 surface soil would be 2E-05. Both cancer risk estimates (i.e., 3E-05 and 2E-05) are within the USEPA target cancer risk range (1E-04 to 1E-06). Only three sample locations have cPAH concentrations exceeding the RIDEM residential soil screening level of 400 ug/kg.
- 5 – Concentrations of arsenic in surface soil and manganese in subsurface soil were within literature background ranges (background range for arsenic: < 0.1 to 73 mg/kg; background manganese range: 2 mg/kg to 7,000 mg/kg) (source: Shacklette and Boerngen, 1984; values are for Eastern U.S.). Concentrations of arsenic in surface soil were also within NCBC Davisville background values (the available upper prediction limit is 13 mg/kg).
- 6 – The noncancer toxicity criteria for Aroclor-1254 were used for Total Aroclor.
- 7 – Only one sample location has a manganese concentration that exceeds the USEPA RSL for residential soil of 1800 mg/kg.
- 8 – If the maximum total Aroclor concentration in Study Area 04 surface soil (8300 ug/kg) were removed from the data set and replaced with the highest detection limit of the non-detected results (40 ug/kg), the 95% UCL concentration would be 1.5 mg/kg instead of 4.0 mg/kg. Using 1.5 mg/kg as the EPC, the noncarcinogenic HI for Study Area 04 surface soil would be approximately equal to 1 and the carcinogenic risk for Study Area 04 surface soil would be approximately equal to 7E-06. Therefore, the USEPA noncarcinogenic target level (HI=1) and the RIDEM target cancer risk level (2E-05) would not be exceeded.

cPAHs = carcinogenic polycyclic aromatic hydrocarbons

EPC = exposure point concentration

HI = Hazard Index

RIDEM = Rhode Island Department of Environmental Management

RSL = Regional Screening Level

UCL = upper confidence limit

USEPA = United States Environmental Protection Agency

References:

Shacklette and Boerngen, 1984. Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States. U.S. Geological Survey Paper 1270.

## SUMMARY TABLE 2

**SUMMARY OF COCs SELECTED FOR DIRECT CONTACT  
HUMAN HEALTH RISK RATIO EVALUATION  
CED AREA, FORMER NCBC DAVISVILLE  
NORTH KINGSTOWN, RHODE ISLAND**

Site/Study Area	Environmental medium	Receptors	Chemicals of Concern
Study Area 01	Surface soil	Resident	cPAHs <sup>(3)</sup>
	Subsurface soil	NA	None
Site 02	Surface soil	NA	None
	Subsurface soil	Construction worker	Manganese <sup>(2)</sup>
Site 03	Surface Soil	Resident	TPH <sup>(1)</sup>
	Subsurface Soil	NA	None
Study Area 04	Surface Soil	Resident	Total Aroclor

- 1 – TPH was selected as a COC based on a comparison of concentrations to the RIDEM residential soil criterion. Only one sample result was available for TPH. The detected TPH concentration (3110 mg/kg) exceeds both the RIDEM residential soil screening level (500 mg/kg) and the RIDEM industrial soil screening level (2500 mg/kg).
- 2 - Manganese concentrations in subsurface soil were within literature background values.
- 3 - Arsenic concentrations in surface soil were within literature background values (source: Shacklette and Boerngen,1984; values are for Eastern U.S.) and also within NCBC Davisville background values; therefore, arsenic was not retained as a COC for Study Area 01.

COC = Chemical of Concern

cPAHs = carcinogenic polycyclic aromatic hydrocarbons

TPH = Total Petroleum Hydrocarbons

References:

Shacklette and Boerngen,1984. Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States. U.S. Geological Survey Paper 1270.

SUMMARY TABLE 3

SUMMARY OF GROUNDWATER PROTECTION EVALUATION<sup>(1)</sup>  
 HUMAN HEALTH RISK RATIO EVALUATION  
 CED AREA, FORMER NCBC DAVISVILLE  
 NORTH KINGSTOWN, RHODE ISLAND  
 PAGE 1 OF 2

Site	Environmental medium	Potential Chemicals of Concern	Comments
Study Area 01	Surface soil	Methylene chloride, PCE, 4-Chloroaniline, cPAHs, Naphthalene, alpha-BHC, dieldrin, Arsenic, Iron	Methylene chloride is a common laboratory contaminant. 4-Chloroaniline and alpha-BHC were detected in only 1 of 29 samples. Dieldrin was detected in only 2 of 29 samples. PCE, 4-chloroaniline, cPAHs, naphthalene, alpha-BHC, and dieldrin were not detected in subsurface soil. Only 2 sample locations have benzo(a)pyrene results exceeding the MCL-based SSL. The metals reflect background.
	Subsurface soil	Methylene chloride, Arsenic, Cobalt, Iron	Methylene chloride is a common laboratory contaminant. The metals reflect background.
Site 02	Surface soil	Arsenic, Iron, Lead, TPH	Arsenic and iron reflect background. The average of all lead results (96.3 mg/kg) does not exceed the SSL at a DAF of 20 (SSL at a DAF 20 = 280 mg/kg). The average TPH concentration (400 mg/kg) does not exceed RIDEM GA leachability criterion (500 mg/kg). Lead concentrations do not exceed SSL at DAF 20 in subsurface soil. TPH was not a subsurface soil analyte.
	Subsurface soil	Ethylbenzene, Total Xylenes, Naphthalene, Arsenic, Cobalt, Iron, Manganese	Ethylbenzene and total xylenes were detected in only 2 of 13 samples; naphthalene was detected in only 1 of 10 samples. Metals except cobalt reflect background. Deep subsurface soil (> 10 feet) data were not screened against groundwater protection criteria.

SUMMARY TABLE 3

SUMMARY OF GROUNDWATER PROTECTION EVALUATION <sup>(1)</sup>  
 HUMAN HEALTH RISK RATIO EVALUATION  
 CED AREA, FORMER NCBC DAVISVILLE  
 NORTH KINGSTOWN, RHODE ISLAND  
 PAGE 2 OF 2

Site	Environmental medium	Potential Chemicals of Concern	Comments
Site 03	Surface Soil	Chloroform, Cobalt, Iron, Lead, TPH	Maximum chloroform concentration is very low (2 ug/kg). Cobalt and iron reflect background. Lead in TCLP metals (maximum = 2620 ug/L) exceeds RIDEM TCLP criterion (40 ug/L) at 2 sample locations. Lead in subsurface soil (only 2 samples available) did not exceed criteria. Only 1 sample result was available for TPH (3110 mg/kg); the TPH concentration exceeds both RIDEM GA leachability (500 mg/kg) and GB leachability (2500 mg/kg) criteria.
	Subsurface Soil	Arsenic, Iron	Arsenic and iron reflect background.
Study Area 04	Surface Soil	Total Aroclor	The average total Aroclor concentration (1300 ug/kg) exceeds the USEPA SSL based on a DAF = 1 (8.8 ug/kg) and a DAF = 20 (176 ug/kg). No RIDEM GA leachability criterion is available for total Aroclor. No subsurface soil data is available for Study Area 04.

1 – Metals selected as potential COCs for groundwater protection were detected at concentrations within literature background levels except for cobalt in Site 02 subsurface soil and lead in Site 02 and Site 03 surface soil. Additionally, arsenic is within NCBC Davisville background levels.

cPAHs = carcinogenic polycyclic aromatic hydrocarbons

DAF = dilution attenuation factor

MCL = Maximum Contaminant Level

PCE = tetrachloroethene

RIDEM = Rhode Island Department of Environmental Management

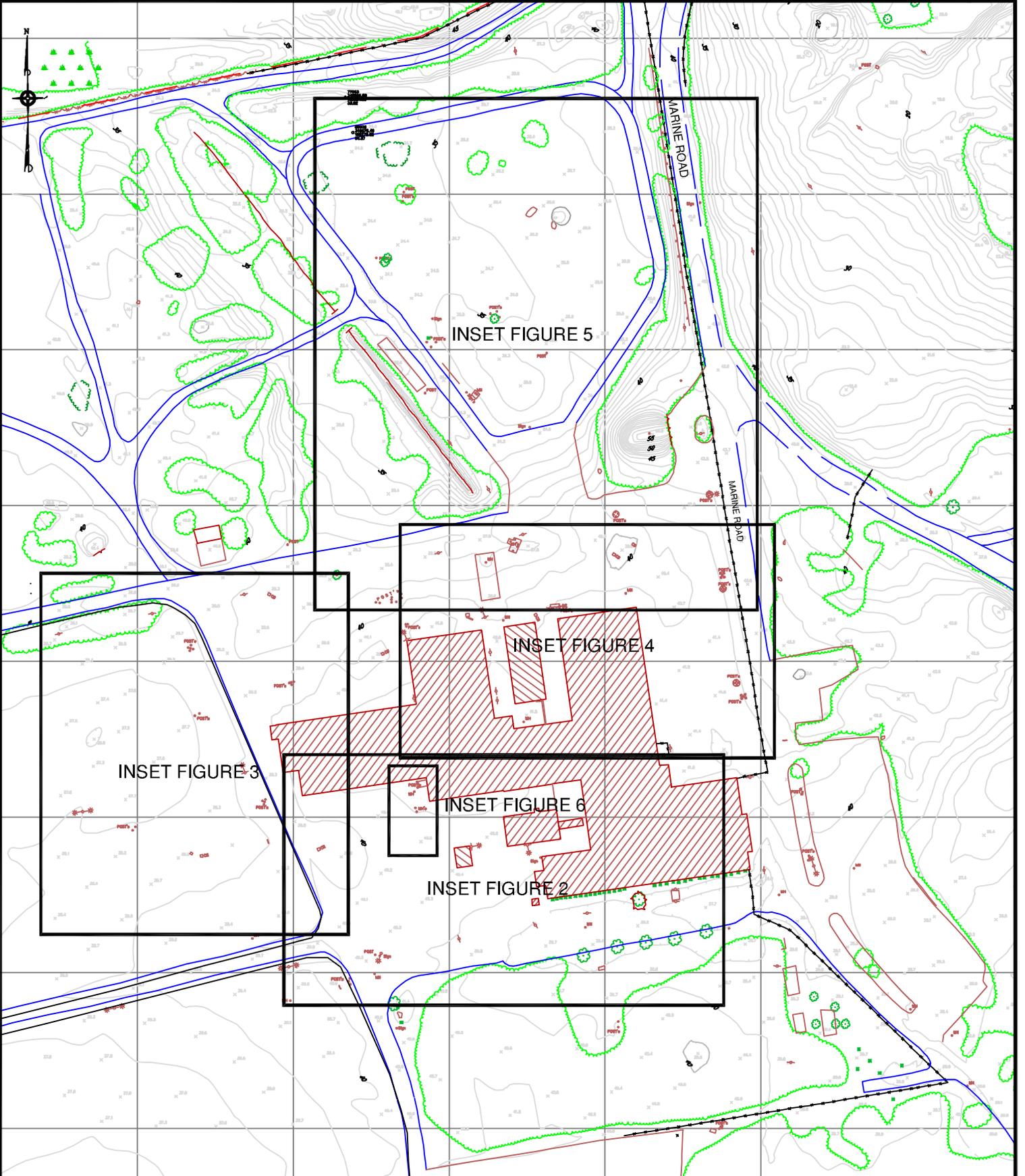
SSL = soil screening level

TCLP = Toxicity Characteristic Leaching Procedure

TPH = Total Petroleum Hydrocarbons

VOC = volatile organic compound

## FIGURES



Legend:

Scale:

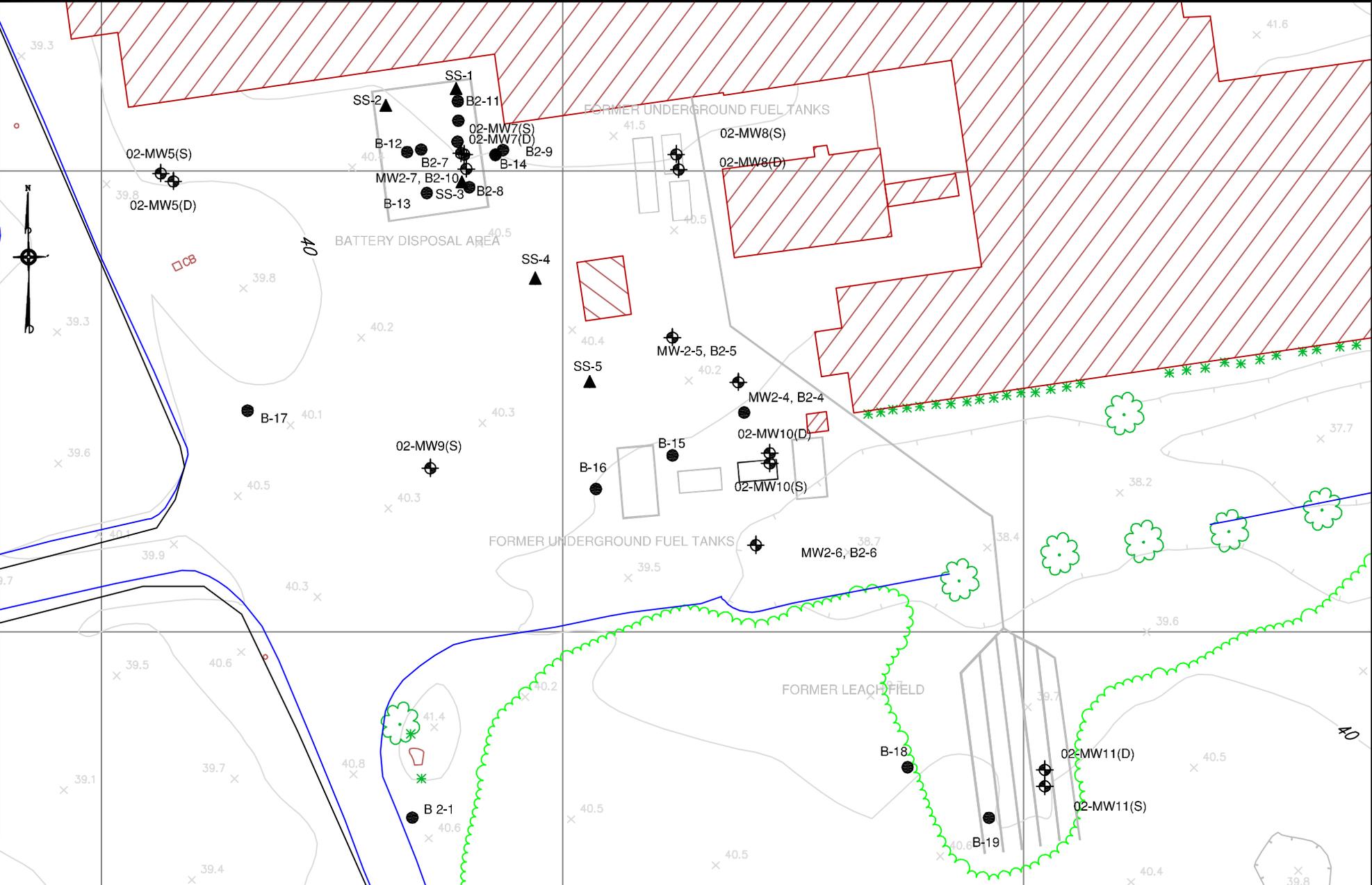
Scale in feet



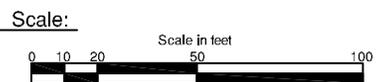
TETRA TECH

CED AREA SITE PLAN  
 HUMAN HEALTH RISK EVALUATION  
 FORMER NCBC DAVISVILLE  
 NORTH KINGSTOWN, RHODE ISLAND

SCALE AS NOTED	
FILE QDC OUTFALL 001.DWG	
REV 0	DATE 11/15/10
FIGURE NUMBER 1	



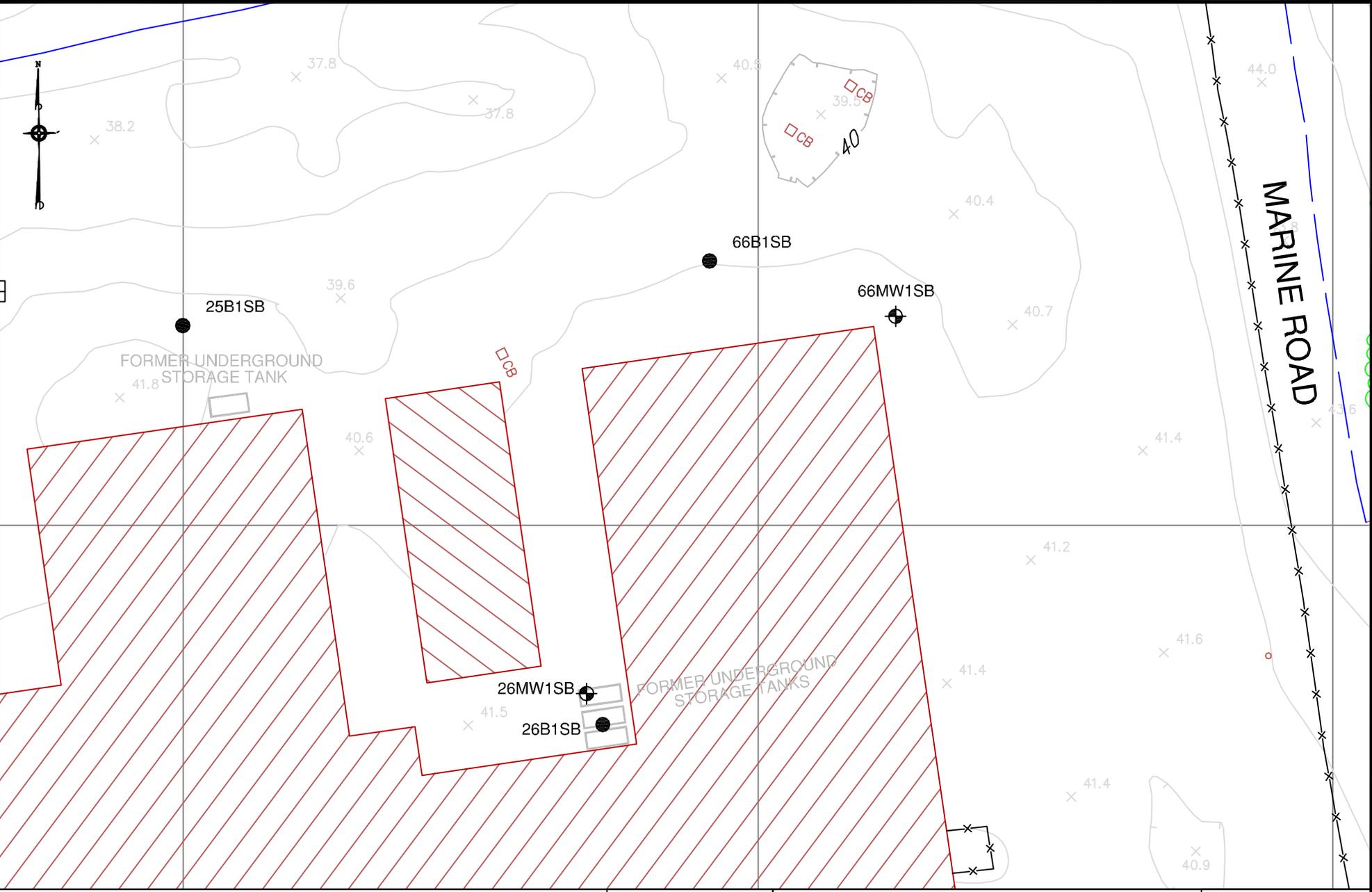
- Legend:**
- ▲ - Surficial Soil Sample Location
  - - Soil Boring Location
  - ⊕ - Monitoring Well Location



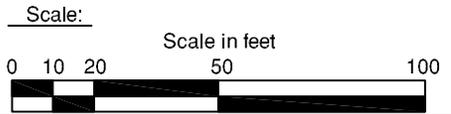
CED AREA INSET  
 HUMAN HEALTH RISK EVALUATION  
 FORMER NCBC DAVISVILLE  
 NORTH KINGSTOWN, RHODE ISLAND

AS NOTED	
FILE FIGURE 1.DWG	
REV 0	DATE 11/15/10
FIGURE NUMBER 2	





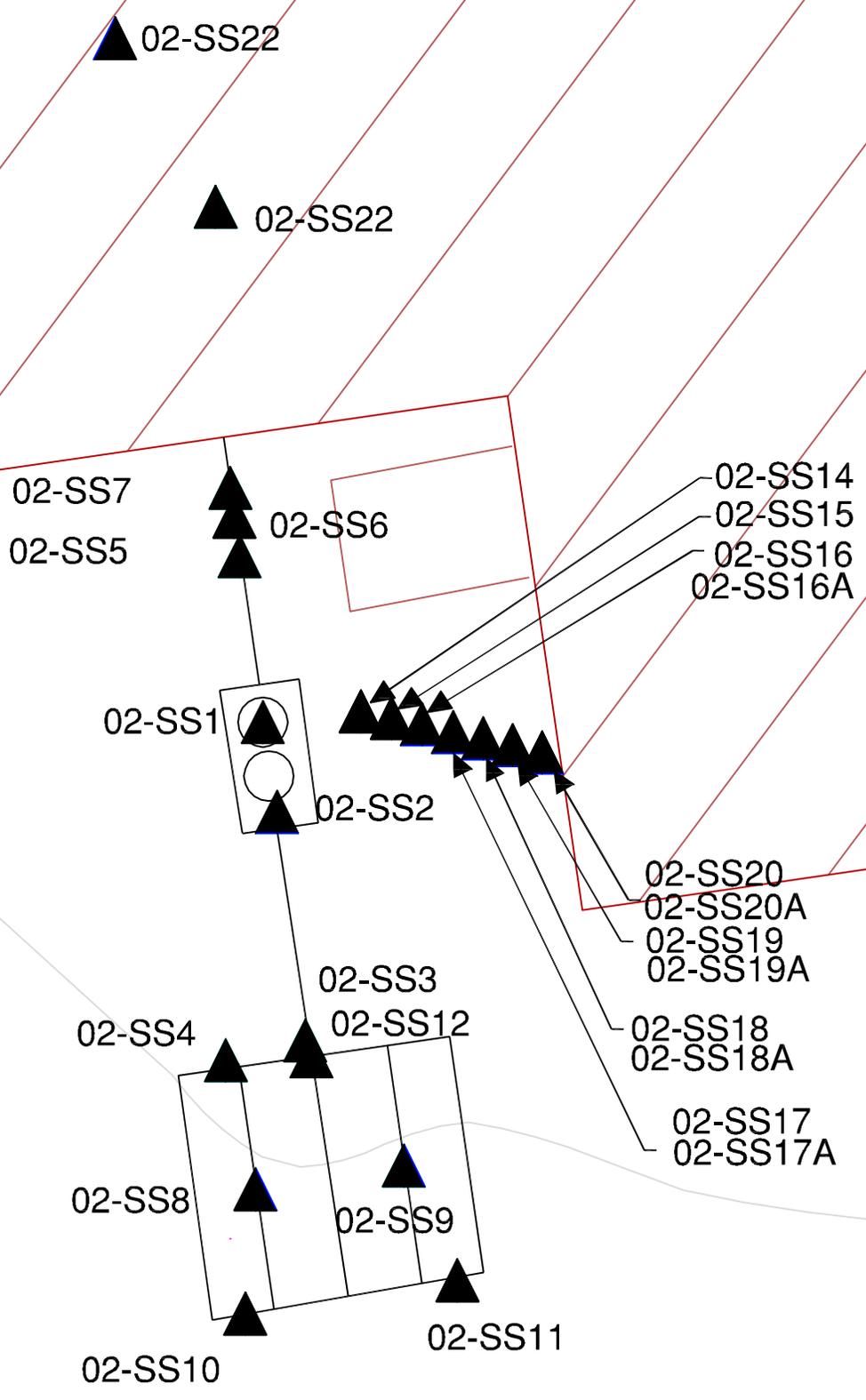
- Legend:**
- - Soil Boring Location
  - ⊕ - Monitoring Well Location



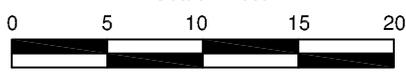
CED AREA INSET  
 HUMAN HEALTH RISK EVALUATION  
 FORMER NCBC DAVISVILLE  
 NORTH KINGSTOWN, RHODE ISLAND

AS NOTED	
FILE FIGURE 4.DWG	
REV 0	DATE 11/15/10
FIGURE NUMBER 4	





Scale:  
Scale in feet



**Legend:**

 - Surticial Soil/Drain Sample

02-SS1



CED AREA INSET  
 HUMAN HEALTH RISK EVALUATION  
 FORMER NCBC DAVISVILLE  
 NORTH KINGSTOWN, RHODE ISLAND

SCALE AS NOTED	
FILE FIGURE 6.DWG	
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FIGURE NUMBER 6	